

Controlling introduced predators in the rangelands: the conclusion

Fauna reconstruction projects rely on the effective control of introduced predators. Significant progress has been made towards long-term, sustained control of foxes and feral cats in the rangelands.

by Dave Algar and Jacqui Richards



Significant projects are under way to restore fauna diversity to reserves and former pastoral leases in Western Australia's rangelands, often involving the translocation of threatened native fauna species from other areas in the State (see 'Giant steps: industry and conservation make history through Gorgon' on page 10). The success of projects such as these relies on the control of introduced predators, particularly the feral cat and fox.

Initial successes were achieved during 2006 and 2007 in controlling feral cats and foxes in the southern rangelands of WA (see 'Controlling feral animals in the rangelands', *LANDSCOPE*, Autumn 2008). This was part of a collaborative project between the

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Main Rangelands, Mt Gibson.

Photo - Marie Lochman

Below Former pastoral lease, Karara Station—one of the study sites.

Photo - Stefanie Hilmer/DEC



Department of Environment and Conservation (DEC) and the Australian Wildlife Conservancy (AWC), in partnership with the Invasive Animals Cooperative Research Centre (IA CRC).

The project undertook to develop an effective, landscape-scale and cost-efficient baiting strategy for introduced predators in this region, and its success could see DEC's *Western Shield* program aiming to achieve the successful reconstruction and conservation of biodiversity expand to the rangelands. Long-term, sustained control of introduced predators means fauna can be translocated. This project

follows successful research programs and operational feral cat baiting trials conducted in the interior arid zone at the Gibson Desert Nature Reserve and more recently at Lorna Glen, a former pastoral lease station 150 kilometres north-east of Wiluna (see 'Into the wild: restoring rangelands fauna', *LANDSCOPE*, Winter 2009).

The feral problem

Feral cats and foxes have become widespread across the mainland of Australia since their arrival with European settlers. Cats are believed to have been introduced around 1800 and foxes in the 1870s. Predation by feral cats and foxes is recognised to be one of the major threats to the survival of many threatened mammal and bird species. Management of these introduced predators is now generally viewed as critical to successfully reintroduce, recover or maintain populations of small-to-medium-sized native fauna.



The field-based research project started in 2006 and was completed in mid-2009. It was conducted at DEC's reclaimed pastoral leases of Karara and Lochada, purchased for the creation of conservation reserves, and at AWC's nearby Mt Gibson Wildlife Sanctuary. The study sites are approximately 350 kilometres north-east of Perth. Karara and Lochada pastoral stations cover an area of about 2,000 square kilometres, while Mt Gibson is about 1,300 square kilometres.

For the first two years, Karara-Lochada was used as the 'control' or non-baited site and Mt Gibson was used as the 'treatment' site, where introduced predators were controlled with an annual aerial baiting. In 2008 and 2009, baiting was also implemented at Karara-Lochada, replicating the baiting regime conducted at Mt Gibson. While this meant removing the control site, it was hoped that this addition would determine whether the baiting strategy trialed at Mt Gibson was also effective at Karara-Lochada, where introduced predator numbers were far higher.

Taking the bait

Feral cats do not readily take the baits widely used to control foxes and wild dogs. However, foxes and wild dogs readily take feral cat baits (*Eradicat*®). This means cat baits could be used for controlling both feral cats and canids. *Eradicat*® baits used in this project and earlier baiting campaigns in the arid zone have been developed and produced by DEC specifically for the control of feral cats. The baits are made at DEC's bait manufacturing facility at Harvey and use the 1080 poison derived from the native poison pea plant.

The hypothesis tested was that effective and sustained introduced predator control was achievable using a feral cat baiting 'strategy'—a baiting approach based on specific timing, intensity and frequency. This strategy involves an annual baiting program, conducted in June to August, using *Eradicat*® baits distributed at a density of 50 baits per square kilometre. Previous research has shown that baiting programs for feral cats are most effective during the cool, dry winter periods. At this time, the abundance and



Above Fox.
Photo - Stefanie Hilmer/DEC

activity of all prey types—in particular predator-vulnerable young mammals and reptiles—is at its lowest, and bait degradation due to rainfall, ants and hot, dry weather is significantly reduced.

The plan was to determine the impact of this baiting strategy on feral cat and fox numbers. Predator reinvasion and distribution was monitored to show how effective the strategy was over time and whether there was a need for additional control programs for individual species throughout the year.

Baiting successes

Surveys of introduced predator activity in 2006, before the start of the baiting strategy, indicated that both fox and feral cat activity were much greater at Karara-Lochada than Mt Gibson. At Mt Gibson, cat activity was much higher than for foxes, possibly due to previous fox baiting programs undertaken by AWC.

The first aerial baiting program was conducted across Mt Gibson in winter 2006. A comparison of introduced predator activity measured before and after baiting indicated a highly effective campaign with no fox tracks recorded immediately following baiting. A 95 per cent reduction in feral cat activity was also recorded. At the same time, activity indices for foxes and cats at the non-baited Karara-Lochada site remained relatively stable.

Successes recorded after the first baiting program were again demonstrated in the second year (2007) at Mt Gibson, with an 85 per cent reduction in fox activity and no records of feral cats. Interestingly, cat activity at Karara-Lochada also declined by 60 per cent in conjunction with an increase

Sand plots and sticky wickets—how the survey was done

Eight track survey transects were located at each of the two study areas, each comprising 11 sand plots located at one-kilometre intervals. The survey transects ran along existing tracks and provided a broad coverage of each area. The sand plots contained several lures to entice animals to cross the plot and thereby maximise the number of plot visits for each survey period. The plots containing lures were termed 'active plots'. Sand plots that contained no lures—'passive plots'—were located each half-kilometre in between. Each plot consisted of a metre-long patch of sand that extended the width of the track. Both ends of the plot were blocked by fallen brush or trees, thereby forcing animals to walk across the plot. At active plots, a channel was cleared into the vegetation at one end of the plot and the lures were located in the channel.

Each plot was examined for the presence or absence of feral cat and fox tracks, on four consecutive days during each survey period. The animal track activity information collected was used to calculate 'activity indices' for both species. The efficacy of the baiting program was then assessed by comparing these indices immediately before and following individual baiting programs.

Activity at the same sand plots was also measured at seasonal intervals (in October, December and April) in addition to the baiting period (June to August) to provide information on the rate and extent of reinvasion into the baited site. In 2008 and 2009, an additional survey was conducted at the end of summer or in early autumn to determine the best time to consider conducting an additional fox baiting program.

During the project, a new technique was developed which significantly increased the information available to researchers. The technique—known as the 'sticky wicket'—involves putting double-sided tape on posts at the entrance to the active sand plots which snags hair as animals brush past to reach the lures. DNA can then be extracted from the hair, without actually having to trap the animals.

Hair capture from foxes was conducted for the 2008 and 2009 survey periods at the Karara-Lochada site. The amount of hair collected enabled good DNA extraction back in the laboratory and the samples to be genotyped well. This technique now enables collection of data to identify specific individuals at plots, which can, in turn, provide estimates of population size in the region, a measurement that has proven nearly impossible for researchers to acquire in the past.



in fox activity. After examining the data, questions arose: Were the active plots being monopolised by foxes and therefore having reduced visits by feral cats? Or was this decrease in cat activity a real decline in abundance? Reduced cat track activity at the passive plots, which were only crossed as part of normal movement patterns, suggested that cat numbers had in fact declined.

In 2008, the third annual winter baiting program was conducted at Mt Gibson and, for the first time, at Karara-Lochada. Fox activity was substantially reduced at Mt Gibson and also at Karara-Lochada following the baiting program. The new technique of DNA analysis of collected hair samples

from Karara-Lochada now made it possible to identify individual animals at sand plots and calculate more robust estimates of abundance (see box above). These estimates demonstrated a major reduction in fox numbers following the 1080 baiting program. Unlike the reductions observed in fox activity, the third baiting program appeared to have no significant impact on feral cat activity at either site.

Watching the weather

It is thought that a major rainfall event that occurred immediately after baiting in 2008, dumping more than 20 millimetres across both sites, may have caused the different response by

foxes and feral cats to the baiting program. This rain would have made the baits unpalatable to cats. The foxes' propensity to eat any and all baits they encounter is likely to be the reason why major reductions in fox activity at both Mt Gibson and Karara-Lochada were achieved following baiting, despite the rain. Bait longevity in the field, baiting intensity and bait distribution therefore become critical components in developing successful baiting campaigns to target feral cats.

The final baiting program of the project was conducted in the winter of 2009 in the absence of any rainfall events. This baiting resulted in major reductions in activity of both feral cats



and foxes, as displayed in the first two baiting programs at Mt Gibson.

Reinvasion

The results of the project suggest that fox and feral cat activity could be substantially reduced for a number of months after each winter baiting. These predator indices, particularly for foxes, gradually increased during the late summer and autumn, the main dispersal period for juvenile foxes. But were these increases actually due to an increase in the number of foxes or was it just an increase in fox activity? Perhaps foxes were moving more throughout the landscape as vacant territories became available.

Analysis of DNA from the fox hair snagged at Karara-Lochada during the latter two years of the project confirmed that reinvasion was occurring principally during late summer and autumn. It also showed that these animals tended to range further than adult foxes resident in a non-baited area. The individual data suggested that fox numbers were increasing but, at the same time, those foxes were displaying an increase in activity as hair from individuals was being collected more widely.

Feral cat reinvasion following the baiting programs appeared to occur at a much slower rate. It remains unclear whether this is because the cat social structure is more complex than that of

Above A 'sticky wicket' set up at a monitoring plot.

Photo – Stefanie Hilmer/DEC

foxes, with juveniles often remaining within the natal home range for longer, or because feral cats do not disperse as far.

An effective control tool

Over its four-year duration, the project has demonstrated that the sustained control of foxes and feral cats in the rangelands can be achieved using a feral cat baiting strategy. Since the initial 2006 baiting program at Mt Gibson, feral cat activity has never



Above Feral cat.
Photo - Jiri Lochman



Left Baits being sweated—a process to make them most palatable to cats.
Photo - Dave Hawke/DEC

recovered to its original level. Indices of fox activity crashed following each baiting and their numbers remained low until late summer or autumn, when juvenile foxes disperse and reinvade, the extent of which varies annually.

The picture is less clear for feral cats at Karara-Lochada, where indices of activity decreased before the introduction of the baiting program. However, implementation of the baiting program during the latter two years of the project possibly prevented the population from increasing and, in fact, reduced cat activity to zero following the final 2009 baiting program. As at Mt Gibson, major declines in fox abundance at Karara-Lochada were achieved following baiting and limited increases in their numbers occurred during the juvenile dispersal period.

The project demonstrated the importance of using long-term

weather forecasts to ensure baiting programs are conducted only when prolonged periods of fine weather are assured. An operational protocol has now been established within DEC and AWC to minimise the possibility of poor baiting outcomes due to adverse weather conditions.

It was also decided that predator control could potentially be enhanced with additional baiting using fox baits during autumn. The additional baiting would not only reduce fox numbers during the key dispersal period, but also suppress fox numbers until the subsequent *Eradicat*® baiting in winter. This would increase bait availability for feral cats and therefore bait effectiveness during the annual winter baiting. Ongoing monitoring of introduced predator abundance will determine the need to conduct individual baiting programs at each location. The impact of reinvasion by foxes and particularly feral cats can also be mitigated to some extent by increasing the size of the area baited. This will essentially provide a buffer zone around a core area of conservation significance.

Right Hair samples collected on a 'sticky wicket' helps in the identification of individual animals.

Photo – Neil Hamilton/DEC

The way forward

Routine monitoring of feral cat and fox abundance is a critical component of AWC's conservation programs, and in the operational management of DEC's *Western Shield* program. One of the major outcomes of this project was the development of the 'sticky wicket' technique. Trapping feral predators has always been a notoriously difficult task and so the ability to identify individual animals from DNA extracted from snagged hair is particularly significant. This data provides the ability to identify specific individuals at plots and provide more accurate estimates of population size and home ranges. Researchers can now examine how well indices of relative abundance—such as presence at sand plots—reflect true abundance. It is possible to use this information to help interpret sand plot data and improve the robustness of the technique.

This project has gone a long way towards demonstrating that long-term, sustained control of feral cats and foxes can be achieved in the rangelands. Some native species, such as mala (*Lagorchestes hirsutus*) and greater stick-nest rats (*Leporillus conditor*) may possibly survive only when introduced predators are completely absent—these species will need offshore and 'mainland islands' (fenced areas) to survive. However, a large number of native species can survive if the densities of predators are reduced (rather than their populations being totally eliminated). If it is possible to successfully control introduced predator densities over large areas, the door will be open for a number of fauna reintroductions, helping to build resilience in the populations of many native species. The integrated feral cat and fox baiting strategy and techniques developed by DEC, AWC and the IA CRC during this program will help make this vision a reality.

One of the next major challenges is to determine whether this integrated feral cat and fox baiting strategy can be extended to the south-west of WA.



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The Invasive Animals Cooperative Research Centre (IA CRC) aims to counteract the impact of invasive animals in Australia through the development and application of new technologies and by integrating approaches across agencies and jurisdictions. Its website (www.invasiveanimals.com) provides information about IA CRC programs.

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